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Date: December 7, 2006 Rebecca A. Bellas
Rebecca A. Bellas

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application

Applicant:	Lyons	:	Art Unit:	2822
Serial No.:	10/817,467	:	Examiner:	Monica Lewis
Filed:	April 2, 2004	:		

Title: POLYMER DIELECTRICS FOR MEMORY ELEMENT ARRAY INTERCONNECT

Mail Stop Appeal Brief – Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF

Dear Sir:

Appellants' representative submits this brief in connection with an appeal of the above-identified patent application.

I. Real Party in Interest (37 C.F.R. §41.37(c)(1)(i))

The real party in interest in the present appeal is Spansion LLC, which received this patent application from Advanced Micro Devices, Inc., the original assignee of the present application.

II. Related Appeals and Interferences (37 C.F.R. §41.37(c)(1)(ii))

Appellants, appellants' legal representative, and/or the assignee of the present application are not aware of any appeals or interferences which will directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims (37 C.F.R. §41.37(c)(1)(iii))

Claims 1-20 are pending in the application. The rejection of claims 1-9 is being appealed.

IV. Status of Amendments (37 C.F.R. §41.37(c)(1)(iv))

Claim amendments had not been made after the Final Office Action.

V. Summary of Claimed Subject Matter (37 C.F.R. §41.37(c)(1)(v))

A. Independent Claim 1

Independent claim 1 relates to a semiconductor device. The semiconductor device contains a substrate; a polymer dielectric over the substrate; and at least one active device comprising an organic semiconductor material and a passive layer. Coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched (see, for example, page 3, lines 21-24).

VI. Grounds of Rejection to be Reviewed (37 C.F.R. §41.37(c)(1)(vi))

A. Whether claims 1-9 are inherently anticipated by Lyons et al. (US Patent No. 6,955,939 B1, hereinafter "Lyons") even though Lyons does not disclose each and every feature of the claims.

VII. Argument (37 C.F.R. §41.37(c)(1)(vii))

A. Lyons, The Cited Art Relied on by the Examiner

Lyons relates to an organic memory device. The organic memory device contains a patternable, photosensitive dielectric and organic memory cells on a substrate. The memory cell is made of two electrodes with a controllably conductive media between the two electrodes. The controllably conductive media contains an organic semiconductor layer and passive layer.

B. The Examiner's Rationale

In the final rejection dated July 7, 2006, the Examiner explained the rejections by stating on pages 2-4:

> In regards to claim 1, . . . [a]lthough Lyons does not specifically disclose the limitations listed above [(e.g., coefficients of thermal expansion of the polymer dielectric and organic semiconductor material)], the same material is utilized in Lyons as in Applicant's invention therefore it would inherently have the same characteristics.
>
> . . .
>
> In regards to claim 4, . . . [a]lthough Lyons does not specifically disclose the limitations listed above [(e.g., a polymer dielectric's glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less)], the same material is utilized in Lyons as in Applicant's invention therefore it would inherently have the same characteristics.
>
> . . .
>
> In regards to claim 5, . . . [a]lthough Lyons does not specifically disclose the limitations listed above [(e.g., a polymer dielectric's dielectric constant below about 3)], the same material is utilized in Lyons as in Applicant's invention therefore it would inherently have the same characteristics.

C. Appellants' Rebuttal of the Examiner's Rationale

i. Lyons Does Not Anticipate Claims 1-9

a. The Standard of Anticipation

In order for anticipation to exist, a single cited art reference expressly or inherently describes each and every feature set forth in the claim. *Trintec Industries, Inc., v. Top-U.S.A. Corp.*, 295 F.3d 1292, 63 U.S.P.Q.2D 1597 (Fed. Cir. 2002). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

b. Anticipation by Inherency Does Not Exist

Claim 1 relates to a semiconductor device containing a polymer dielectric and an organic semiconductor. The polymer dielectric has a coefficient of thermal expansion that substantially matches a coefficient of thermal expansion of the organic semiconductor. Since the coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched, changes in temperature do not deleteriously affect the performance, reliability, and/or mechanical integrity of the semiconductor device.

Lyons does not disclose each and every feature set forth in claim 1. Lyons discloses numerous photosensitive dielectric materials (Col. 4, line 5 - Col. 10, line 62 of Lyons) and numerous organic polymers (Col. 12, line 64 - Col. 15, line 58 of Lyons). However, Lyons does not disclose a semiconductor device containing a polymer dielectric and an organic semiconductor material, wherein coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched. In fact, Lyons does not mention anything about coefficients of thermal expansion of the two materials.

To rely on inherency, "[i]nherency does not embrace probabilities or possibilities." *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1297 (Fed. Cir. 2002). "The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency." *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

In the present situation, Lyons does not disclose a semiconductor device in which coefficients of thermal expansion of a polymer dielectric and an organic semiconductor material are substantially matched. A coefficient of thermal expansion of a certain dielectric material disclosed in Lyons may or may not accidentally or occasionally match a coefficient of thermal expansion of a certain organic polymer disclosed in Lyons. However, the mere allegation that a coefficient of thermal expansion of a certain dielectric material among numerous dielectric materials may match a coefficient of thermal expansion of a certain organic polymer among numerous organic polymers is not sufficient to establish inherency.

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) and MPEP 2112 IV (Examiner must provide rationale or evidence tending to show inherency). In the present situation, the Examiner must identify where there is factual support in Lyons that shows coefficients of thermal expansion of a polymer dielectric and organic semiconductor material in a semiconductor device are substantially matched. The Examiner failed to identify the support.

For the reasons provided above, Appellants respectfully submit that claim 1 is not anticipated expressly or inherently by Lyons.

With respect to claim 4, Lyons discloses numerous photosensitive dielectric materials (Col. 4, line 5 - Col. 10, line 62) and numerous organic polymers (Col. 12, line 64 - Col. 15, line 58). However, Lyons does not disclose a semiconductor device containing a polymer dielectric and an organic semiconductor material, wherein coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched and the polymer dielectric has a glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less. As discussed above, the mere allegation that coefficients of thermal expansion of a certain dielectric material

and a certain organic polymer of Lyons may match and the polymer dielectric may has a glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less is not sufficient to establish inherency. See *In re Rijckaert*.

The Examiner failed to identify where there is factual support in Lyons that shows coefficients of thermal expansion of the polymer dielectric and organic semiconductor material in a semiconductor device are substantially matched and the polymer dielectric in the semiconductor device have a glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less. See MPEP 2112 IV (Examiner must provide rationale or evidence tending to show inherency).

With respect to claim 5, Lyons discloses numerous photosensitive dielectric materials (Col. 4, line 5 - Col. 10, line 62) and numerous organic polymers (Col. 12, line 64 - Col. 15, line 58). However, Lyons does not disclose a semiconductor device containing a polymer dielectric and an organic semiconductor material, wherein coefficients of thermal expansion of a polymer dielectric and organic semiconductor material are substantially matched and the polymer dielectric has a dielectric constant below about 3. As discussed above, the mere allegation that coefficients of thermal expansion of a certain dielectric material and a certain organic polymer of Lyons may match and the polymer dielectric may have a dielectric constant below about 3 is not sufficient to establish inherency. See *In re Rijckaert*.

The Examiner failed to identify where there is factual support in Lyons that shows coefficients of thermal expansion of the polymer dielectric and organic semiconductor material in a semiconductor device are substantially matched and the polymer dielectric in the semiconductor device has a dielectric constant below about 3. See MPEP 2112 IV (Examiner must provide rationale or evidence tending to show inherency).

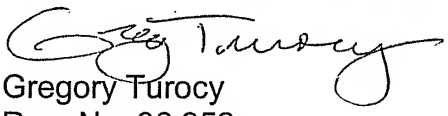
VIII. Conclusion

For at least the reasons provided in detail above, claims 1-9 are not

anticipated by Lyons. Accordingly, Appellants respectfully submit that the claims on appeal are patentable in all aspects and therefore request reversal of the rejection.

A credit card payment form is filed concurrently herewith in connection with all fees due regarding this document. In the event any additional fees may be due and/or are not covered by the credit card, the Commissioner is authorized to charge such fees to Deposit Account No. 50-1063.

Respectfully submitted,
AMIN, TUROCY & CALVIN, LLP



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IX. Claims Appendix (37 C.F.R. §41.37(c)(1)(viii))

1. A semiconductor device, comprising:

a substrate;

a polymer dielectric over the substrate; and

at least one active device comprising an organic semiconductor material and a passive layer,

wherein coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched.

2. The semiconductor device of claim 1, wherein the polymer dielectric comprises at least one selected from the group consisting of polyimides, fluorinated polyimides, polysilsequioxanes such as hydrogen polysilsequioxanes, methyl polysilsequioxanes, butyl polysilsequioxanes, and phenyl polysilsequioxanes, benzocyclobutenes (BCB), fluorinated benzocyclobutene, polyphenylene, polysilazanes, polyphenylquinoxaline, copolymers of 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, perfluoroalkoxy resin, fluorinated ethylene propylene, fluoromethacrylate, poly(arylene ether), fuorinated poly(arylene ether), fluorinated parylenes, poly(p-xylxylenes), fluorinated poly(p-xylxylenes), parylene F, parylene N, parylene C, parylene D, amorphous polytetrafluoroethylene, polyquinoline, polyphenylquinoxalines, and polymeric photoresist materials.

3. The semiconductor device of claim 1, wherein the polymer dielectric comprises a self patternable material.

4. The semiconductor device of claim 1, wherein the polymer dielectric has a glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less.

5. The semiconductor device of claim 1, wherein the polymer dielectric has a dielectric constant below about 3.

6. The semiconductor device of claim 1 further comprising a conductive polymer.

7. The semiconductor device of claim 1, wherein the organic semiconductor material comprises at least one selected from the group consisting of polyacetylene; polydiphenylacetylene; poly(t-butyl)diphenylacetylene; poly(trifluoromethyl)diphenylacetylene; polybis(trifluoromethyl)acetylene; polybis(t-butyldiphenyl)acetylene; poly(trimethylsilyl) diphenylacetylene; poly(carbazole)diphenylacetylene; polydiacetylene; polyphenylacetylene; polypyridineacetylene; polymethoxyphenylacetylene; polymethylphenylacetylene; poly(t-butyl)phenylacetylene; polynitro-phenylacetylene; poly(trifluoromethyl) phenylacetylene; poly(trimethylsilyl)pheylacetylene; polydipyrrylmethane; polyindoqiunone; polydihydroxyindole; polytrihydroxyindole; furane-polydihydroxyindole; polyindoqiunone-2-carboxyl; polyindoqiunone; polybenzobisthiazole; poly(p-phenylene sulfide); polyaniline; polythiophene; polypyrrole; polysilane; polystyrene; polyfuran; polyindole; polyazulene; polyphenylene; polypyridine; polybipyridine; polyphthalocyanine; polysexithiofene; poly(siliconoxohemiporphyrazine); poly(germaniumoxohemiporphyrazine); poly(ethylenedioxythiophene); polymetallocene complexes; and polypyridine metal complexes.

8. The semiconductor device of claim 1, wherein the passive layer comprises at least one selected from the group consisting of copper sulfide, copper rich copper sulfide, copper oxide, copper selenide, copper telluride, manganese oxide, titanium dioxide, indium oxide, silver sulfide, gold sulfide, iron oxide, cobalt arsenide, and nickel arsenide.

9. The semiconductor device of claim 1, wherein at least one active device comprises a first and a second electrode, a passive layer adjacent the first electrode, and the organic semiconductor material adjacent the second electrode.

10. The semiconductor device of claim 1, further comprising two electrodes, wherein the active device is between the two electrodes.

11. The semiconductor device of claim 10, wherein the polymer dielectric comprises at least one selected from the group consisting of polyimides, fluorinated polyimides, polysilsequioxanes such as hydrogen polysilsequioxanes, methyl polysilsequioxanes, butyl polysilsequioxanes, and phenyl polysilsequioxanes, benzocyclobutenes (BCB), fluorinated benzocyclobutene, polyphenylene, polysilazanes, polyphenylquinoxaline, copolymers of 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, perfluoroalkoxy resin, fluorinated ethylene propylene, fluoromethacrylate, poly(arylene ether), fuorinated poly(arylene ether), fluorinated parylenes, poly(p-xylxylenes), fluorinated poly(p-xylxylenes), parylene F, parylene N, parylene C, parylene D, amorphous polytetrafluoroethylene, polyquinoline, polyphenylquinoxalines, and polymeric photoresist materials.

12. The semiconductor device of claim 10, wherein the polymer dielectric has a glass transition temperature or a melting point of about 135° C. or higher and about 400° C. or less.

13. The semiconductor device of claim 10, wherein the polymer dielectric has a dielectric constant below about 2.4.

14. The semiconductor device of claim 10, wherein the polymer dielectric is formed by one of spin-on techniques and chemical vapor deposition techniques.

15. The semiconductor device of claim 10, wherein the organic semiconductor material comprises at least one selected from the group consisting of polyacetylene; polydiphenylacetylene; poly(t-butyl)diphenylacetylene; poly(trifluoromethyl)diphenylacetylene; polybis(trifluoromethyl)acetylene; polybis(t-butyldiphenyl)acetylene; poly(trimethylsilyl) diphenylacetylene; poly(carbazole)diphenylacetylene; polydiacetylene; polyphenylacetylene; polypyridineacetylene; polymethoxyphenylacetylene; polymethylphenylacetylene; poly(t-butyl)phenylacetylene; polynitro-phenylacetylene; poly(trifluoromethyl) phenylacetylene; poly(trimethylsilyl)pheylacetylene; polydipyrrylmethane; polyindoqiunone; polydihydroxyindole; polytrihydroxyindole; furane-polydihydroxyindole; polyindoqiunone-2-carboxyl; polyindoqiunone; polybenzobisthiazole; poly(p-phenylene sulfide); polyaniline; polythiophene; polypyrrole; polysilane; polystyrene; polyfuran; polyindole; polyazulene; polyphenylene; polypyridine; polybipyridine; polyphthalocyanine; polysexithiofene; poly(siliconoxohemiporphyrazine); poly(germaniumoxohemiporphyrazine); poly(ethylenedioxythiophene); polymetallocene complexes; and polypyridine metal complexes.

16. The semiconductor device of claim 10, wherein the passive layer comprises at least one selected from the group consisting of copper sulfide, copper rich copper sulfide, copper oxide, copper selenide, copper telluride, manganese oxide, titanium dioxide, indium oxide, silver sulfide, gold sulfide, iron oxide, cobalt arsenide, and nickel arsenide.

17. A semiconductor device, comprising:

a substrate;

a polymer dielectric over the substrate;

at least one active device comprising an organic semiconductor material and a passive layer; and

a conductive polymer adjacent at least one active device,

wherein coefficients of thermal expansion of the polymer dielectric and organic semiconductor material are substantially matched.

18. The semiconductor device of claim 17, wherein the polymer dielectric has a glass transition temperature or a melting point of about 125° C. or higher and about 425° C. or less and a dielectric constant below about 3.

19. The semiconductor device of claim 17, wherein the polymer dielectric comprises at least one selected from the group consisting of polyimides, fluorinated polyimides, polysilsequioxanes such as hydrogen polysilsequioxanes, methyl polysilsequioxanes, butyl polysilsequioxanes, and phenyl polysilsequioxanes, benzocyclobutenes (BCB), fluorinated benzocyclobutene, polyphenylene, polysilazanes, polyphenylquinoxaline, copolymers of 2,2-bistrifluoromethyl-4,5-difluoro-1,3-dioxole, perfluoroalkoxy resin, fluorinated ethylene propylene, fluoromethacrylate, poly(arylene ether), fuorinated poly(arylene ether), fluorinated parylenes, poly(p-xylxylenes), fluorinated poly(p-xylxylenes), parylene F, parylene N, parylene C, parylene D, amorphous polytetrafluoroethylene, polyquinoline, polyphenylquinoxalines, and polymeric photoresist materials.

20. The semiconductor device of claim 17, wherein the active device comprises a polymer memory device comprising the organic semiconductor material and the passive layer between two electrodes, the organic semiconductor material comprising a conjugated polymer.

X. Evidence Appendix (37 C.F.R. §41.37(c)(1)(ix))

None.

XI. Related Proceedings Appendix (37 C.F.R. §41.37(c)(1)(x))

None.